Appendix A.
Statistical Methodology

THE CENSUS POPULATION

The target population for the 2016 Certified Organic Survey was all U.S. farms and ranches certified for meeting the standards of the National Organic Program (NOP) administered by the USDA's Agricultural Marketing Service (AMS). (NOP standards are available on the internet at www.ams.usda.gov/nop.) Only data from operations certified by an AMS approved agent are published.

To ensure that all certified organic farms and ranches were provided the opportunity to complete the survey, the list of farms and ranches contacted for this survey included producers identified as certified organic or transitioning to organic certification in NASS' List Frame and the AMS Certified Organic List. The final census count included 18,418 producers that met the criteria. Table A provides the census count and response rates for the U.S. and each state. The census count is the number of records from the mail list that had certified organic production in 2016 or whose operational status was unknown. The census count for the U.S. was 15,806. The response rate is the percent of the census count that completed the report form. The response rate for the U.S. was 60 percent.

Table B provides the certified organic farm counts and acres from the 2015 Certified Organic Survey and the 2016 survey.

DATA COLLECTION

Report Form

A 12-page report form was designed using lessons learned from the 2015 Certified Organic Survey and input from USDA's Risk Management Agency (RMA). Additionally, eight cognitive interviews of the form were conducted in California with farms and ranches in the target population. The report form collected information about certified organic production and sales of field crops, vegetables, fruits, tree nuts, berries, floriculture crops, nursery crops, mushrooms, Christmas trees, maple syrup, livestock, livestock products, poultry, and poultry products. See Appendix B for a copy of the final report form and instruction sheet.

Methods of Enumeration

The initial mailout occurred in early February 2017. The mail packet included a cover letter with instructions on how to complete the survey online and response due dates, a labeled report form, an instruction sheet, and a return envelope. One follow-up mailout to nonrespondents occurred in late February 2017. Printing, mail packet preparations, and mailouts were managed by the U.S. Census Bureau's National Processing Center (NPC) in Jeffersonville, IN. Alternatively, respondents had the option to complete the report form online. Additional interviews occurred via telephone by NASS Data Collection Centers and in person by National Association of State Departments of Agriculture (NASDA) staff from March 2017 through July 2017.

As usual with NASS survey practices, a select group of producers was scheduled for contact on another NASS agricultural survey in this time period. To minimize the number of agency contacts, data were collected simultaneously for this group by NASS staff in the Regional Field Offices (RFO) or by NASDA staff. RFO and NASDA staff collected data by personal enumeration or by phone from February 2017 through July 2017.

PROCESSING

Data Capture

All report forms returned to the NPC were immediately checked in, using bar codes printed on the mailing label, and removed from the follow-up

mailout. All forms with any data were scanned and an image was created for each page of a report form. After the images were created, the data were keyed as reported from the paper form received. Any inconsistencies and respondent remarks were reviewed by statisticians in the RFOs and corrected, if necessary, during data editing and analysis.

Data Editing and Analysis

Data from each report form were processed through a computer edit which flagged missing or conflicting entries. Each report with a flagged entry was reviewed by RFO and/or Headquarters statisticians. Action was required for any record with reported data that were clearly incorrect, for example, in some cases, respondents may have failed to provide all of the information requested, only indicating the presence of an item but not the amount. These items were tagged for machine imputation.

After the initial edit, an automated regression imputation program supplied missing data based on similar certified organic agricultural data. A post-imputation computer edit was performed to ensure imputation actions provided acceptable results. Instances where imputed data failed edit checks were referred to statisticians for corrective action.

The computer edit ensured the data on a report form were internally consistent. Analysis tools were provided to examine the data across records to check for distributional irregularities and data outliers. Statisticians corrected suspect data when necessary and re-edited the record.

ESTIMATION

NASS's goal was to produce certified organic agricultural totals for the publication that were fully adjusted for list undercoverage and nonresponse. Although much effort was expended making the 2016 Certified Organic Survey list as complete as possible, it did not include all U.S. organic farms and ranches, resulting in list undercoverage. Some certified organic producers did not respond to the survey, despite numerous attempts to contact them.

Nonresponse Weights

Not every producer that was contacted provided the requested data. Nonrespondents were accounted for in the final data by increasing the survey weights of the respondents inversely to the proportion of nonrespondents. Record-level list frame control data and 2012 Census of Agriculture (CoA) state-level number of certified organic farms and ranches were used to define weighting cells (strata) comprised of farms and ranches of similar size or production. The counts of survey respondents and nonrespondents were used to compute the adjustment factor for the weighting cell. The methodology assumed nonresponse was random. For example, a weighting cell has 100 farms and ranches of which 80 responded and 20 did not. Every respondent would have its original weight of 1 increased to 1.25 (100/80) to represent the farms and ranches not responding.

Undercoverage Weights

The 2012 CoA was used to adjust for undercoverage. The records of respondents to the 2016 Certified Organic Survey were matched to the records responding on the 2012 CoA organic production section. For the records that responded as having organic production on both the 2016 survey and on the 2012 CoA, the undercoverage weights from the 2012 CoA were applied to the 2016 survey response. These records were used to build a regression model of undercoverage weights using 2016 survey responses. For each 2016 survey response that did not match to a 2012 CoA record, the estimated weight from the regression model was that record's undercoverage weight.

MEASURES OF SURVEY QUALITY

Results of the 2016 Certified Organic Survey are subject to nonsampling errors. Sources of nonsampling errors include respondent reporting errors, recording errors, errors in data capture, or errors in action taken during editing and imputation. Extensive efforts were made to minimize these types of errors. Table C provides statistical precision estimates for the number of farms and ranches and acres and the total value of sales for the United States and for each state.

Table A. **Certified Organic Survey Census Count and Response Rates: 2016**

[For meaning of abbreviations and symbols, see introductory text.]

Geographic area	Census count (number)	Response rate (percent)
United States	15,806	60
Alabama	41	48
Alaska	13	65
Arizona	62	53
Arkansas	50	72
California	2,902	59
Colorado	209	58
Connecticut	65	58
Delaware	5	38
Florida	226	41
Georgia	422	49
Hawaii	139	52
Idaho	215	55
Illinois	234	58
Indiana	445	65
Iowa	781	63
Kansas	110	57
Kentucky	105	80
Louisiana	19	53
Maine	410	68
Maryland	108	65
Massachusetts	136	58
Michigan	470	58
Minnesota	607	55
Mississippi	27	60
Missouri	285	68
Montana	169	71
Nebraska	187	60
Nevada	37	64
New Hampshire	109	57
New Jersey	76	57
New Mexico	112	60
New York	1,112	58
North Carolina	288	70
North Dakota	128	54
Ohio	619	65
Oklahoma	60	67
Oregon	523	59
Pennsylvania	840	63
Rhode Island	20	48
South Carolina	69	59
South Dakota	96	67
Tennessee	49	70
Texas	309	56
Utah	51	64
Vermont	531	66
Virginia	174	70
Washington	711	51
West Virginia	11	96
Wisconsin	1,379	58
Wyoming	60	48

Table B. **Land Used for Certified Organic Production: 2016 Certified Organic Survey and 2015 Certified Organic Survey**

[For meaning of abbreviations and symbols, see introductory text.]

Geographic area	2016 Certified Organic Survey		2015 Certified Organic Survey	
	Farms	Acres	Farms	Acres
United States	14,217	5,019,496	12,818	4,361,849
Alabama	18	2,014	22	1,385
Alaska	8	(D)	4	695,186
Arizona	38	33,183	48	23,066
Arkansas	64	4,871	32	2,015
California	2,713	1,069,950	2,637	790,413
Colorado	181	176,496	136	151,571
Connecticut	57	1,691	59	2,536
Delaware	2	(D)	3	(D)
Florida	123	11,679	159	12,757
Georgia	83	5,347	95	3,161
Hawaii	113	7,163	120	1,646
Idaho	166	178,567	168	167,182
Illinois	205	39,153	196	36,952
Indiana	420	43,219	332	34,858
Iowa	732	103,136	674	93,707
Kansas	86	54,208	80	52,199
Kentucky	100	10,255	86	7,497
Louisiana	21	5,426	7	2,714
Maine	494	55,316	476	48,502
Maryland	111	12,450	88	10,442
Massachusetts	127	7,242	130	5,867
Michigan	402	76,192	298	55,926
Minnesota	545	130,688	431	115,321
Mississippi	29	23,414	12	3,044
Missouri	302	41,078	176	31,681
Montana	156	266,048	138	250,531
Nebraska	162	107,371	161	120,798
Nevada	34	12,203	31	12,283
New Hampshire	107	7,858	106	9,282
New Jersey	53	1,521	75	2,349
New Mexico	75	94,143	90	51,638
New York	1,059	264,385	934	238,700
North Carolina	247	31,800	203	28,727
North Dakota	114	116,305	100	110,784
Ohio	575	(D)	463	66,660
Oklahoma	34	18,008	23	6,082
Oregon	461	194,769	409	175,675
Pennsylvania	803	93,418	681	85,164
Rhode Island	25	137	19	(D)
South Carolina	44	3,163	26	2,741
South Dakota	86	115,780	97	92,462
Tennessee	38	3,341	25	2,321
Texas	217	146,801	134	86,665
Utah	51	97,919	54	100,515
Vermont	556	134,336	568	132,643
Virginia	165	24,848	139	23,453
Washington	677	78,739	598	71,781
West Virginia	14	2,362	16	2,439
Wisconsin	1,276	219,266	1,205	209,615
Wyoming	48	119,870	54	128,617

Table C. **Coefficient of Variation: 2016**

[For meaning of abbreviations and symbols, see introductory text.]

Geographic area	Farms		Acres		Value of sales	
	Farms	Coefficient of variation (percent)	Acres	Coefficient of variation (percent)	Total ($1,000)	Coefficient of variation (percent)
United States	14,217	0.4	5,019,496	5.6	7,553,872	3.1
Alabama	18	3.3	2,014	13.6	1,915	8.8
Alaska	8	0.9	(D)	(D)	(D)	(D)
Arizona	38	4.5	33,183	15.3	117,790	9.9
Arkansas	64	3.3	4,871	13.6	39,768	8.8
California	2,713	1.0	1,069,950	9.0	2,889,156	5.8
Colorado	181	1.9	176,496	4.6	181,297	8.6
Connecticut	57	1.4	1,691	1.2	6,943	4.6
Delaware	2	1.4	(D)	(D)	(D)	(D)
Florida	123	3.3	11,679	13.6	72,351	8.8
Georgia	83	3.3	5,347	13.6	48,233	8.8
Hawaii	113	4.5	7,163	15.3	13,408	9.9
Idaho	166	0.9	178,567	24.2	98,005	3.0
Illinois	205	1.4	39,153	1.9	52,106	9.4
Indiana	420	1.4	43,219	1.9	99,124	9.4
Iowa	732	1.5	103,136	4.6	131,188	5.1
Kansas	86	1.6	54,208	4.4	50,020	19.1
Kentucky	100	1.2	10,255	4.3	12,181	5.4
Louisiana	21	3.3	5,426	13.6	11,120	8.8
Maine	494	1.4	55,316	1.2	65,648	4.6
Maryland	111	1.4	12,450	1.2	17,679	4.6
Massachusetts	127	1.4	7,242	1.2	26,125	4.6
Michigan	402	1.4	76,192	1.9	201,067	9.4
Minnesota	545	1.3	130,688	3.6	106,479	4.0
Mississippi	29	3.3	23,414	13.6	16,381	8.8
Missouri	302	1.4	41,078	1.9	101,298	9.4
Montana	156	1.9	266,048	4.6	53,187	8.6
Nebraska	162	1.6	107,371	4.4	95,971	19.1
Nevada	34	1.9	12,203	4.6	29,091	8.6
New Hampshire	107	1.4	7,858	1.2	9,050	4.6
New Jersey	53	1.4	1,521	1.2	8,831	4.6
New Mexico	75	1.9	94,143	4.6	44,979	8.6
New York	1,059	1.4	264,385	2.4	215,859	6.4
North Carolina	247	1.2	31,800	4.3	144,917	5.4
North Dakota	114	1.6	116,305	4.4	22,741	19.1
Ohio	575	2.2	(D)	(D)	101,242	4.3
Oklahoma	34	3.2	18,008	5.9	4,608	10.4
Oregon	461	0.9	194,769	24.2	350,896	3.0
Pennsylvania	803	2.3	93,418	5.0	659,629	14.7
Rhode Island	25	1.4	137	1.2	2,275	4.6
South Carolina	44	3.3	3,163	13.6	11,553	8.8
South Dakota	86	1.6	115,780	4.4	17,320	19.1
Tennessee	38	1.2	3,341	4.3	5,614	5.4
Texas	217	3.2	146,801	5.9	297,484	10.4
Utah	51	1.9	97,919	4.6	26,118	8.6
Vermont	556	1.7	134,336	3.5	127,054	3.1
Virginia	165	1.2	24,848	4.3	55,914	5.4
Washington	677	1.2	78,739	4.5	636,245	6.0
West Virginia	14	1.2	2,362	4.3	2,025	5.4
Wisconsin	1,276	1.5	219,266	2.6	255,450	2.4
Wyoming	48	1.9	119,870	4.6	15,062	8.6